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PRELIMINARY STUDIES OF THE DISTRIBUTION AND ABUNDANCE OF PLANKTONIC CEPHALOPODS IN THE INDIAN EXCLUSIVE ECONOMIC ZONE AND ADJACENT SEAS

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ABSTRACT

Abundance and distribution of planktonic cephalopods collected from the operation of Bongo net in the west coast of India including the Lakshadweep Sea, east coast, Andaman and Nicobar Islands and the Central Equatorial waters have been studied. Relatively greater abundance of cephalopods was noticed on the west coast and Andaman and Nicobar Islands. Their occurrence was more prominent in March - June and August- December on the West coast, and March-September on the east coast. Generally the night hauls were richer than those taken during day. There was not much difference in the relative abundance of planktonic cephalopods in the neritic and oceanic waters except on the west coast where the neritic waters are slightly richer.

INTRODUCTION

Early juveniles of most of the cephalopods are pelagic, irrespective of the different niches occupied by their adults. This columnar habitat of juvenile cephalopods is reflected in their occurrence in the plankton and midwater trawl collections made from the coastal and oceanic waters of the seas around the world. Important observations on the occurrence of planktonic cephalopods are from the Atlantic Ocean (Issel, 1908; Pfeffer, 1912; Clarke, 1966; Clarke and Lu, 1974 and 1975; Lu and Clarke, 1975 a and 1975 b; Roper and Lu, 1978), the Pacific Ocean (Allan, 1945; Okutani and McGowan, 1969; Young, 1972) and the Indian Ocean (Silas, 1968 and 1969; Sakthivel and Aravindakshan, 1971; Aravindakshan and Sakthivel, 1973). The study on these organisms is of great interest as they form the forage to predatory fishes like tunas, mammals such as toothed whales, seals and marine birds (Roper et al., 1984). The present study is based on the planktonic cephalopods taken in Bongo net onboard FORV Sagar Sampada during February 1985 to March 1988.

DATA BASE

The numerical data considered here pertain to the Bongo net samples taken during the Cruise 1 to 44. The area covered includes the west coast of India (6° to 23°N), the east coast (6° to 21°N), Andaman and Nicobar Islands (5° to 15°N) and the Central Equatorial Region of the Indian Ocean (0° to

3°N and 0° to 3°S). The duration of each haul was 10 minutes, towed in all oblique direction from a depth of 150 m to the surface. The volume of zooplankton obtained in each haul was determined by displacement method and an aliquote sample was examined for major plankton constituents. The number of cephalopods in each fraction was raised to the total volume to determine the total number present in each haul. The data from different cruises were pooled together to study the seasonal and spatial distribution. The hauls made during 0600 to 1800 hours were considered as day hauls and the rest as the night hauls. The number per haul has been taken as an index of abundance.

OBSERVATIONS

Regionwise occurrence

The number of hauls made in different regions and the catch of cephalopods are given in Table 1. For the four regions combined, viz., west coast, east coast, Andaman and Nicobar Islands and the Central Equatorial Region, a total of 1129 hauls were made, of which 595 hauls (52.7%) contained cephalopods. Of 677 hauls made off the west coast, 293 hauls (43.3%) yielded cephalopods, amounting to 3276 numbers with an average of 11 per haul. Along the east coast, though the number of hauls were less (316 only), the hauls containing cephalopods were 194 (61.6%), yielding 1105; the number per haul being 6. In the Andaman and Nicobar Islands and the Central Equatorial Region, the

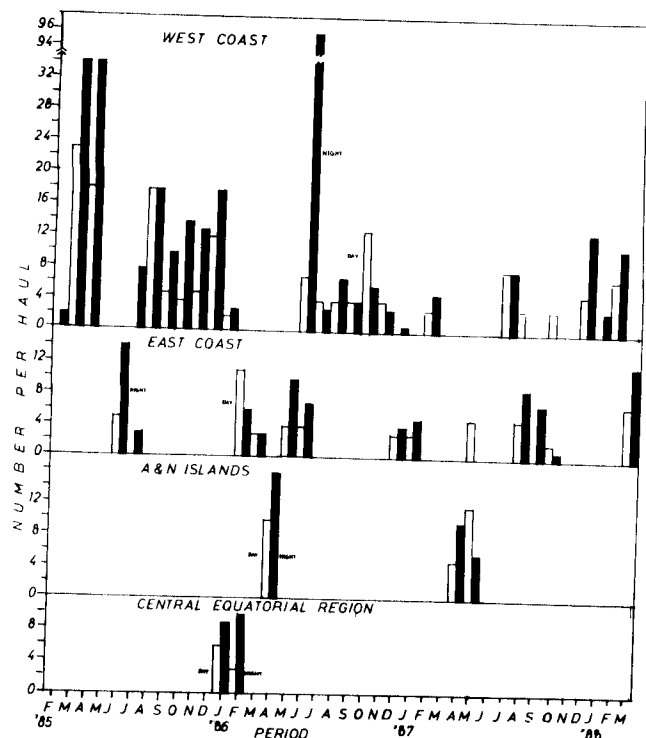


Fig. 2. Diurnal variations in the abundance of planktonic cephalopods.

3 to 96, and in the case of day hauls from 0 to 13; the peak abundance of 96 per haul came in June. In 1987, the night hauls yielded 0 to 13 per haul, whereas the day hauls contained 3 to 8. In 1988, samples were obtained in January and February and the night hauls yielded 3 and 11, and the day hauls 2 and 7. On the east coast the maximum number per day haul came in June, 1985 (5), February, 1986 (11), May (5) and August, 1987 (5) and March, 1988 (7). But the night hauls were better, netting 14 per haul in June, 1985, 10 in May, 1986, 5 in January, 9 in August, 1987 and 12 in March, 1988. In the Andaman and Nicobar islands, maximum number of 10 to 12 was observed in the day hauls and 8 to 15 in the night hauls during April, 1986 and April-May, 1987. In the Central Equatorial Region also a similar trend was noticed: 3 to 6 in the day and 9 to 10 in the night hauls in January- February, 1987. In general, the trend observed was that the night collections were found richer than those obtained during the day, indicating the upward movement of cephalopods in the dark hours.

Abundance in neritic and oceanic waters

The index of planktonic cephalopods (number per haul) in the waters upto 200 m (neritic) and

beyond 200 m depth (oceanic) in the four regions is given in Fig. 3. On the west coast, the neritic waters lying between Latitudes 4° to 12°N and 19° to 22° N yielded larger number of cephalopods (11 to 64/haul) than in the areas lying in between. In the oceanic waters also a similar trend was observed, where the greater number per haul ranged from 8 to 27. On the east coast, the hauls from neritic waters contained 0 to 13 per haul, while the oceanic waters along the entire east coast yielded 3 to 9 per haul. In the case of Andaman and Nicobar Islands, greater number of hauls were taken from the oceanic waters where the number per haul ranged from 4 to 13. In the oceanic Central Equatorial Region, the number per haul ranged from 5 to 12. In general, it appears that the occurrence of planktonic cephalopods is more or less uniform in both neritic and oceanic waters, except on the west coast where the abundance is slightly more in the neritic waters.

DISCUSSION

The present study on the planktonic cephalopods taken in Bongo net operated onboard FORV *Sagar Sampada* indicates that this group is well rep-

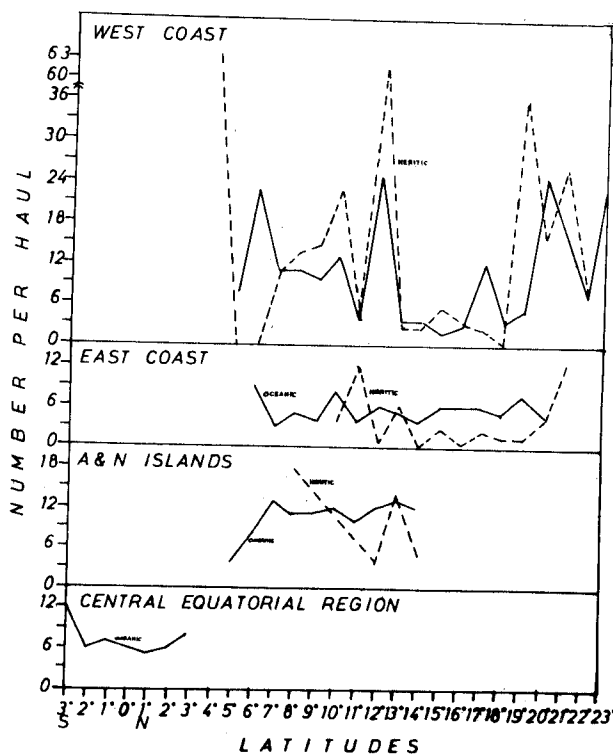


Fig. 3. Relative abundance of planktonic cephalopods in the neritic and oceanic waters.

resented in the Indian Exclusive Economic Zone and the Central Equatorial Region of the Indian Ocean. Among the four areas studied, the greater abundance of cephalopods (6 to 52 per haul) was noticed on the west coast and Andaman and Nicobar Islands. Aravindakshan and Sakthivel (1973) have indicated that the northwest coast, Central Equatorial Region, east coast and the Bay of Bengal including Andamans from where 10 to 80 per haul was recorded in the plankton collections, are rich nurseries for cephalopods. Silas (1968) also recorded 1 to 13 per haul in the Indian Ocean Standard Net from the southwest coast of India.

In the present collections, the peak abundance was noticed during March-June and August-December on the west coast and March to September on the east coast, which is in agreement with the observations by Silas (1968) and Aravindakshan and Sakthivel (1973). Moreover, Aravindakshan and Sakthivel (1973) have indicated January-March and July-August as the peak periods for the occurrence of cephalopods in the equatorial waters of the Indian Ocean. Though the present observations in the Central Equatorial Region have been limited to January-February, good number of cephalopods (7 to 8 per haul) were obtained.

In regard to the day-night variation in abundance of planktonic cephalopods, the night hauls were found richer. It is known that oceanic cephalopods undergo diel vertical migrations, abounding in 400-1000 m during the day and in the uppermost 200 m during the night (Roper *et al.*, 1984). Silas (1968) has recorded almost equal representation of cephalopods in the plankton collections made during the day and night from the neritic waters but greater numbers during the night hauls from the oceanic waters of the west coast of India. In the present study, though there was not much variation in the abundance of cephalopods in the neritic and oceanic waters except for the west coast, the night collections in general were richer than the day collections corroborating the theory of diel vertical migration.

Clarke (1966) and Clarke and Lu (1974, 1975) have indicated that the abundance of cephalopods in the columnar waters is species-specific. The qualitative analysis of cephalopods collected by Bongo net operations during the cruises 1 to 10 of FORV *Sagar Sampada* (Sarvesan and Meiyappan, 1989) has indicated a greater abundance of cephalopods

belonging to the families Eupoloteuthidae, Onychoteuthidae and Ommastrephidae in the night hours, and Sepiidae, Sepiolidae, Loliginidae, Cranchiidae and Octopodidae in the day hours. Further qualitative analysis of samples obtained during the subsequent cruises will throw more light on the seasonal and spatial distribution of cephalopods belonging to different families.

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